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(54) **A SUPPORT UNIT FOR A LADDER AND A LADDER**

(57) A support unit (1) for a ladder (19) is described. The support unit (1) comprises a connection member (3) configured for removably connecting the support unit (1) to a side rail (21) of the ladder (19). The connection member (3) comprises a surface (5) arranged for facing an opposite surface (8) of the side rail (21) and a supporting leg (7) rotatably connected to the connection member (3) and arranged to be rotated around an axis of rotation (a) relatively the connection member (3) between a rest position and an active position. In the active position the supporting leg (7) forms an angle (α) of inclination with the surface (5) of the connection member (3) and in the rest position is arranged to permit the connection member (3) to slide along the side rail (21). In the active position an edge portion (9) of the supporting leg (7) extends through the surface (5) to protrude from the surface (5) and to engage the opposite surface (8) of the side rail (21). A ladder (19) is also described.

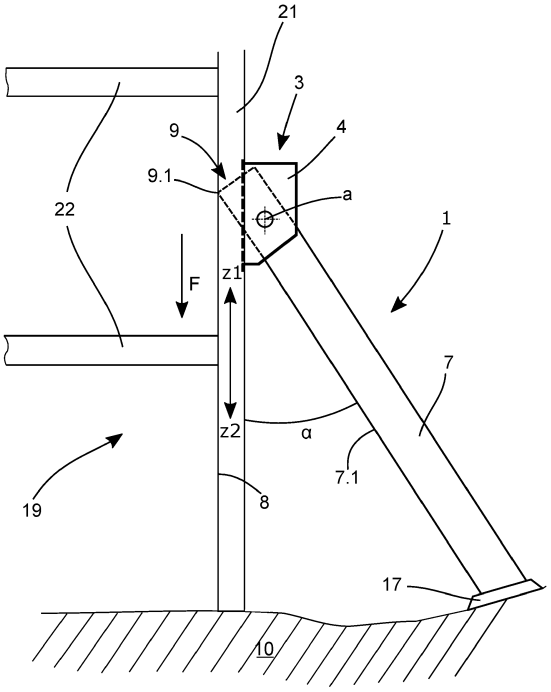

Fig. 4

EP 3 792 447 A1

Description

BACKGROUND OF THE INVENTION AND PRIOR ART

[0001] The present invention relates generally to safety devices and more particularly to a support unit that can make a ladder safe from sliding sideways. The present invention relates also to a ladder comprising at least one support unit.

[0002] Ladders, especially extension ladders, are very effective in allowing a person to reach a high, otherwise inaccessible position for painting, repair or other related tasks. However, accidents frequently occur because of lateral tipping or slipping movements. If the ladder is not completely vertical the chances of it tipping laterally as the person rises thereon increase as the height above the ground increases.

[0003] Efforts have been made to improve the stability of a ladder and people have attempted to provide different types of ladder supports. US7163084B1 and US4655322A are examples where supports are used to prevent sideways tipping of ladders. In the US7163084B1 an adjustable ladder stabilizer is attached to the side rail of a ladder by drilling holes in the rails and attaching a channel mounting bracket by, for example bolts. In the US4655322A a clamp device is used for anchoring of a safety leg to a ladder.

[0004] Although, the devices described in the US7163084B1 and in the US4655322A work well, the construction of the devices is quite complicated and requires several elements. Therefore, there is a desire to provide an improved support unit for a ladder considering, inter alia, facilitating of the attaching procedure of the support unit at the ladder. Further, there is a desire to provide a ladder with an improved support unit.

SUMMARY OF THE INVENTION

[0005] The object of the present invention is to provide an improved support unit for a ladder and to provide a ladder with an improved support unit.

[0006] The object is achieved by the support unit defined in claim 1 and by the ladder defined in claim 11.

[0007] Thus, the above mentioned object is achieved by a support unit for a ladder, comprising: a connection member configured for removably connecting the support unit to a side rail of the ladder. Thus, the connection member is configured to enable the support unit to be connected, i.e. to be attached to the side rail of the ladder and to be removed from the side rail. The process of connecting and removing of the support unit can be repeated.

[0008] The connection member comprises a surface arranged for facing an opposite surface of the side rail. The surface can be defined as a surface of the connection member positioned parallel to the opposite surface of the side rail when the connection member has been positioned at the side rail in a position enabling connection of the support unit to the side rail. Thereby, with the surface arranged for facing an opposite surface of the side rail is meant that the surface can be parallel with the opposite surface of the side rail.

[0009] Further, the support unit comprises a supporting leg rotatably connected to the connection member and arranged to be rotated around an axis of rotation relatively the connection member between a rest position and an active position. The supporting leg may be arranged as an elongated straight or curved element configured to support, i.e. to stabilize a ladder in the active position of the supporting leg when the support unit has been connected, i.e. attached to a side rail of the ladder. In the active position the supporting leg forms an angle of inclination with the surface of the connection member and in the rest position is arranged to permit the connection member to slide along the side rail. Thus, the supporting leg can be rotated around the axis of rotation and thereby can change its position relatively the connection member. For example, in the rest position, the supporting leg may extend along a longitudinal axis parallel with the surface. In the active position the supporting leg is positioned to form the angle of inclination with the surface of the connection member, which may mean that the longitudinal axis of the supporting leg forms the angle of inclination with the surface of the connection member.

[0010] In the active position an edge portion of the supporting leg extends through the surface to protrude from the surface and to engage the opposite surface of the side rail.

[0011] The edge portion may be defined as a part of an outermost portion of the supporting leg on an opposite side to a ground portion of the supporting leg, which ground portion is intended to have contact with the ground when the support unit is in use. Thus, in the active position of the supporting leg the edge portion is arranged to intersect the surface to protrude from the surface and to engage the opposite surface of the side rail. Thereby, the support unit can be secured at the side rail simply by rotating the supporting leg around the axis of rotation to the active position of the supporting leg.

[0012] Consequently, an improved support unit for a ladder is provided considering, inter alia, the way of attaching of the support unit to the side rail. The support unit can be attached to the side rail in a simple manner and without need of complicated attachment means as presented in the prior art documents. Further, at the same time as the support unit is attached to the side rail of the ladder a support for the ladder is also provided by positioning the supporting leg in the active position.

[0013] Thereby the above mentioned object is achieved.

[0014] According to an embodiment the edge portion is arranged to create friction forces between the edge portion and the opposite surface of the side rail in order to lock the support unit at the side rail. The friction forces can be created by a direct contact between the surface of the edge portion and the surface of the opposite sur-

face of the side rail. The friction forces created between the edge portion and the opposite surface of the side rail facilitate the attachment of the support unit and further facilitate the locking of the support unit at the side rail.

[0015] According to an embodiment, the supporting leg is positioned substantially in parallel with the surface in the rest position. Thus, the longitudinal axis of the supporting leg is parallel with the surface.

[0016] According to an embodiment the connection member comprises a plate comprising the surface. Further, the plate comprises an opening and the edge portion is arranged to extend through the opening and thereby through the surface in the active position of the supporting leg. Thereby, the edge portion extends through the surface by extending through the opening of the plate. Thus, a simple connection member is provided enabling the edge portion to extend through the surface and to protrude from the surface to engage the opposite surface of the side rail. The plate is easy to manufacture.

[0017] According to an embodiment, the connection member has a rectangular cross section and is arranged to partly enclose the side rail when the connection member has been connected to the side rail. Thus, the connection member can be attached to the exterior of the side rail.

[0018] According to an embodiment the edge portion protrudes at least 2mm from the surface in the active position of the supporting leg. Thus, the edge portion protrudes sufficiently to enable engagement with the opposite surface of the side rail in order to lock the support unit at the side rail.

[0019] According to an embodiment the supporting leg comprises a ground support element. The ground support element facilitates positioning of the supporting leg at the ground making the supporting leg more stable comparing to a supporting leg not having a ground support.

[0020] According to an embodiment the ground support element comprises two separated support plates angled in relation to each other. The support plates may be angled in relation to each other such that the corner of the angle between the support plates points upwards and towards the edge portion of the supporting leg. Thus, the distance between the support plates increases along a direction downwards from the edge portion and towards the ground. Thereby, support plates angled in relation to each other may contribute to an improved stability of the supporting leg during use of the support unit.

[0021] According to an embodiment the ground support element is attached to the supporting leg by welding. Welding is a relative simple and reliable way of connecting of elements.

[0022] According to an embodiment the connection member and/or the supporting leg are made of aluminium. Thereby, a support unit can be provided with relatively low weight.

[0023] The above mentioned object is also achieved by a ladder comprising two side rails and at least one support unit according to any of the embodiments as above. Preferably the ladder comprises two support units arranged at each side rail of the ladder. Because the support unit exhibits improved characteristics regarding, inter alia, the attachment to a side rail and the stability of the support unit, also an improved ladder is provided comprising at least one support unit.

[0024] Thereby the above mentioned abject is achieved.

[0025] According to an embodiment each of the side rails of the ladder has a rectangular cross section or a circular cross section.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] In the following preferred embodiments of the invention are described with reference to the attached drawings, on which:

Fig. 1 is a side view of a support unit with a supporting leg in an active position, according to a first embodiment,

Fig. 2 is a side view of the support unit in Fig. 1 with supporting leg in a rest position,

Fig. 3 is a side view of a ladder and of the support unit in Fig. 1 with supporting leg in a rest position,

Fig. 4 is a side view of the ladder and of the support unit in Fig. 3 with the supporting leg in an active position,

Fig. 5.1 is a side view of an upper part of the support unit according to the first embodiment,

Fig. 5.2 is a cross view of the support unit in Fig. 5.1,

Fig. 6 is a cross view of a support unit according to a second embodiment and

Fig. 7 is a cross view of a supporting leg comprising a ground support.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

[0027] In Fig. 1 to Fig. 4 a support unit 1 for a ladder 19 is illustrated according to a first embodiment. The support unit 1 comprises a connection member 3 configured for removably connecting the support unit 1 to a side rail 21 of a ladder 19. The ladder 19, or a part of the ladder 19 is illustrated in Fig. 3 and Fig. 4.

[0028] The connection member 3 comprises a surface 5 arranged for facing an opposite surface 8 of the side rail 21. The opposite surface 8 is illustrated, for example in Fig. 3. Further, the connection member 3 comprises a supporting leg 7 rotatably connected to the connection member 3 and arranged to be rotated around an axis of

rotation a, relatively the connection member 3. The supporting leg 7 may comprise an opening 2' through the supporting leg 7. According to the first embodiment the connection member 3 comprises a connection part 4 positioned perpendicularly to the surface 5. The connection part 4 may comprise one plate, or several plates arranged in parallel to each other. Each of the one or several plates may comprise an opening 2". Thus, the supporting leg 7 may be connected to the connection member 3 by means of a joint applied through the openings 2' and 2". The joint may be a bolt joint. The bolt may comprise threads or the bolt may be a screw.

[0029] In Fig. 1, the supporting leg 7 is illustrated in an active position. In the active position the supporting leg 7 forms an angle α of inclination with the surface 5 of the connection member 3. The angle α is formed between the surface 5 and a side edge 7.1 of the supporting leg 7 or the angle α may be formed between the surface 5 and a longitudinal axis 7.2 of the supporting leg 7. The longitudinal axis 7.2 extends along the extension of the supporting leg 7.

[0030] According to the first embodiment the supporting leg 7 is arranged as an elongated straight element extending along the longitudinal axis 7.2. However, the supporting leg 7 may also be arranged as a curved element comprising the longitudinal axis 7.2. The angle α may be between 0 to 180 degrees before the support unit 1 has been arranged at a ladder.

[0031] The supporting leg 7 may be hollow and may comprise four elongated walls. Thus, the cross section of the supporting leg 7 may be rectangular. The supporting leg 7 may be manufactured by bending and, for example, welding of one or several plates of, for example, aluminium. Thus, the supporting leg 7 may comprise two side walls, each comprising a hole for enabling the connection of the supporting leg 7 to the connection part 4 of the connection member 3 which holes may form the opening 2'. Further, the supporting leg 7 may comprise two intermediate walls arranged essentially perpendicularly in relation to the side walls.

[0032] The side walls and the intermediate walls of the supporting leg 7 may have a rectangular shape.

[0033] In the active position of the supporting leg 7, an edge portion 9 of the supporting leg 7 extends through the surface 5 to protrude from the surface 5 and to engage the opposite surface of the side rail (not shown in Fig. 1). Thus, the supporting leg 7 is connected to the connection member 3 such that a first distance d1 between the axis of rotation a and an upper end edge 6 of the supporting leg 7 is greater than a second distance d2 between the axis of rotation a and the surface 5, when the supporting leg 7 is connected to the connection member 3.

[0034] The edge portion 9 is a part of an upper portion of the supporting leg 7. The edge portion 9 comprises a corner edge 9.1. The corner edge 9.1 comprises an upper edge of a first intermediate wall of the two intermediate walls of the supporting leg 7. The first intermediate wall is arranged closer to the surface 5 then a second intermediate wall of the two intermediate elongated walls of the supporting leg 7 when the supporting leg 7 has been connected to the connection member 3.

[0035] The corner edge 9.1 of the edge portion 9 may engage the opposite surface 8 of the side rail 21 in the active position of the supporting leg 7.

[0036] Further, the supporting leg 7 may comprise a ground support element 17. An example of a ground support element 17 is described in details in conjunction to Fig. 7.

[0037] The connection member 3 and/or the supporting leg 7 may be made of aluminium. Other possible materials for the connection member 3 and/or for the supporting leg 7 could be, for example, steel, a carbon fiber material or other suitable material. The other parts of the support unit 1, as the joint or the support element 17 may be made of the same material as the connection member 3 and/or the supporting leg 7 or may be made of different materials.

[0038] In Fig. 2, the supporting leg 7 of the support unit 1 is illustrated in a rest position. In the rest position the supporting leg 7 is arranged to permit the connection member 3 to slide along the side rail 21 of the ladder 19. The supporting leg 7 may be positioned substantially parallel with the surface 5 in the rest position of the supporting leg 7.

[0039] Each of the side walls comprises an upper edge 6.1 and a lower edge 6.2. According to an embodiment, the upper edge 6.1 may be angled in relation to the intermediate wall with an edge portion angle γ that is less than 90 degrees. Thus, the upper edge 6.1 may be inclined in relation to the longitudinal axis 7.2 of the supporting leg 7 by the edge portion angle γ. For example, the edge portion angle γ may be between 30 and 60 degrees. The sharp edge portion angle γ may facilitate positioning of the supporting leg 7 in the active position.

[0040] Also the lower edge 6.2 of each of the side walls of the supporting leg 7 may be angled in relation to the intermediate wall with an angle equal to the edge portion angle γ or with a sharp angle that is different than the edge portion angle γ. Thus, also the lower edge 6.2 may be inclined in relation to the longitudinal axis 7.2 of the supporting leg 7 by the edge portion angle γ.

[0041] According to an embodiment each of the side walls of the supporting leg 7 may have a shape of a parallelogram.

[0042] As mentioned above, the edge portion angle γ may be, for example, between 30 and 60 degrees. Thus, a third distance d3 between the axis of rotation a and a corner edge 9.1' of the supporting leg 7 is greater than a second distance d2 between the axis of rotation a and the surface 5, when the supporting leg 7 is connected to the connection member 3.

[0043] In Fig. 3 a ladder 19 is illustrated with a support unit 1 at one side rail 21 of the ladder 19 comprising two side rails 21. A plurality of roads 22, forming steps, extend between and connect the two side rails 21 to each other. The side rails 21 with the roads 22 connected to the side

rails 21 form the ladder 19.

[0044] Preferably the ladder 19 comprises two support units 1 arranged at each side rail 21 of the ladder 19. According to the first embodiment illustrated in Fig. 3, the supporting leg 7 of the support unit 1 is positioned in a rest position. The supporting leg 7 positioned in the rest position may facilitate mounting of the support unit 1 at the ladder 19 and may facilitate transportation of the ladder 19 with the support unit 1 at the ladder 19.

[0045] As illustrated in Fig. 3 the surface 5 of the connection member 3 is arranged for facing an opposite surface 8 of the side rail 21 of the ladder 19. The surface 5 may be positioned parallel to the opposite surface 8 when the support unit 1 has been positioned at the side rail 21. According to the first embodiment the connection member 3 of the support unit 1 may be slide into the interior of the side rail 21 having a C-shaped cross section. Thus, the side rail 21 comprises an elongated opening 15 (shown in Fig. 5.2) extending along the extension of the side rail 21.

[0046] The support unit 1 can be positioned in a desired position along the extension of the side rail 21 simply by sliding the connection member 3 in directions z1, z2 along the extension of the side rail 21.

[0047] In Fig. 4 the ladder 19 and the support unit 1 are illustrated, where the supporting leg 7 has been positioned in the active position. After the connection member 3 has been slid along the side rail 21, the ladder 19 can be positioned on the ground 10. The position of the support unit 1 at the side rail 21 can by adjusted by sliding the connection member in the directions z1 and z2, depending on the conditions of the ground 10 and/or depending on the form of the ground 10. When the desired position of the support unit 1 has been achieved, enabling stabilization of the ladder 19, the supporting leg 7 is rotated to the active position.

[0048] In the active position of the supporting leg 7 the edge portion 9 of the supporting leg 7 abuts the opposite surface 8 of the side rail 21 of the ladder 19. The edge portion 9 abutting the opposite surface 8 causes creation of friction forces between the edge portion 9 and the opposite surface 8. The friction forces between the edge portion 9 and the opposite surface 8 contribute to locking of the support unit 1 at the desired position along the side rail 21. Thereby, the support unit 1 can be locked at the side rail 21 simply by rotating the supporting leg 7 to the active position.

[0049] The friction forces increase when a user is climbing on the ladder 19 due to the weight of the user. The weight of the user causes a pressure force F to act on the ladder 19 and on the supporting leg 7 which force contributes to an increase the friction forces between the edge portion and the opposite surface 8. Thereby, the stability of the ladder 19 may be improved during the use of the ladder thanks to the friction forces locking the support unit 1 at the side rail 21.

[0050] The edge portion 9 may protrude at least 2 mm from the surface 5 in the active position of the supporting leg 5.

[0051] According to the first embodiment, see Fig 5.1 and Fig. 5.2, the connection member 3 comprises a base plate 13. The base plate 13 comprises the surface 5. Thus, the surface 5 is one of the surfaces of the base plate 13 which surface 5 is arranged to face the opposite surface 8 of the side rail 21 of the ladder 19. In the first embodiment, the plates of the connection part 4 extend perpendicularly from the base plate 13, in particular from a surface being opposite to the surface 5.

[0052] The base plate 13 comprises an opening 15. In the first embodiment, the opening 15 is located between the plates of the connection part 4.

[0053] The edge portion 9 is arranged to extend through the opening 15 and thereby through the plate 13 and through the surface 5 in the active position of the supporting leg 7. Thus form and the size of the opening 15 is adapted to the form and the size of the supporting leg 7 such that the edge portion 9 of the supporting leg 7 can be displaced through the opening 15 and can reach the opposite surface 8 of a side rail in the active position of the supporting leg 7.

[0054] The supporting leg 7 may form a rectangular cross-sectional shape. The shape of the opening 15 may also be rectangular. The dimension of the opening 15 need to be greater than the dimensions of edge portion 9 of the supporting leg 7 to enable the edge portion 9 of the supporting leg 7 can be displaced through the opening 15.

[0055] According to the second embodiment illustrated in Fig. 6, the connection member 3 may have a rectangular cross section and being arranged to partly enclose the side rail 21 when the connection member 3 has been connected to the side rail 21. Thus, the connection member 3 may be slide along the outer surface of the side rail 21.

[0056] As illustrated in Fig. 7, the ground support element 17 may comprise two separated support plates 23 angled in relation to each other by a ground support angle β. The ground support angle β may for example be between 35 and 120 degrees. According to an embodiment each of the ground support elements 17 is attached to the supporting leg 7 by welding.

[0057] The present invention is no limited to the embodiments disclosed but may be varied and modified within the scope of the following claims.

Claims

1. A support unit (1) for a ladder (19), comprising:

- connection member (3) configured for removably connecting the support unit (1) to a side rail (21) of the ladder (19), wherein the connection member (3) comprises a surface (5) arranged for facing an opposite surface (8) of the side rail (21) and

- a supporting leg (7) rotatably connected to said connection member (3) and arranged to be rotated around an axis of rotation (a) relatively the connection member (3) between a rest position and an active position, wherein in said active position the supporting leg (7) forms an angle (α) of inclination with said surface (5) of the connection member (3) and in said rest position is arranged to permit the connection member (3) to slide along the side rail (21),

characterized in that
in said active position an edge portion (9) of the supporting leg (7) extends through the surface (5) to protrude from said surface (5) and to engage the opposite surface (8) of the side rail (21).

2. The support unit (1) according to claim 1, wherein the edge portion (9) is arranged to create friction forces between the edge portion (9) and the opposite surface (8) of the side rail (21) in order to lock the support unit (1) at the side rail (21).

3. The support unit (1) according to claim 1 or 2, wherein in said rest position, the supporting leg (7) is positioned substantially parallel with the surface (5).

4. The support unit (1) according to any of claims 1 to 3, wherein said connection member (3) comprises a plate (13) comprising said surface (5), wherein the plate (13) comprises an opening (15) and said edge portion (9) is arranged to extend through the opening (15) and thereby through said surface (5) in the active position of the supporting leg (7).

5. The support unit (1) according to any of claims 1 to 4, wherein said connection member (3) has a rectangular cross section and is arranged to partly enclose the side rail when the connection member (3) has been connected to the side rail.

6. The support unit (1) according to any of claims 1 to 5, wherein the edge portion (9) protrudes at least 2 mm from the surface (5) in said active position of the supporting leg (5).

7. The support unit (1) according to any of claims 1 to 6, wherein the supporting leg (7) comprises a ground support element (17).

8. The support unit (1) according to claim 7, wherein the ground support element (17) comprises two separated support plates (23) angled in relation to each other.

9. The support unit (1) according to claim 7 or 8, wherein the ground support element (17) is attached to the supporting leg (7) by welding.

10. The support unit (1) according to any of claims 1 to 9, wherein the connection member (3) and/or the supporting leg (7) are made of aluminium.

11. A ladder (19) comprising two side rails (21) and at least one support unit (1) according to any of claims 1 to 10, preferably the ladder (19) comprises two support units (1) arranged at each side rail (21) of the ladder (19).

12. The ladder (19) according to claim 11, wherein each of the side rails (21) of the ladder (19) has a rectangular cross section or a circular cross section.

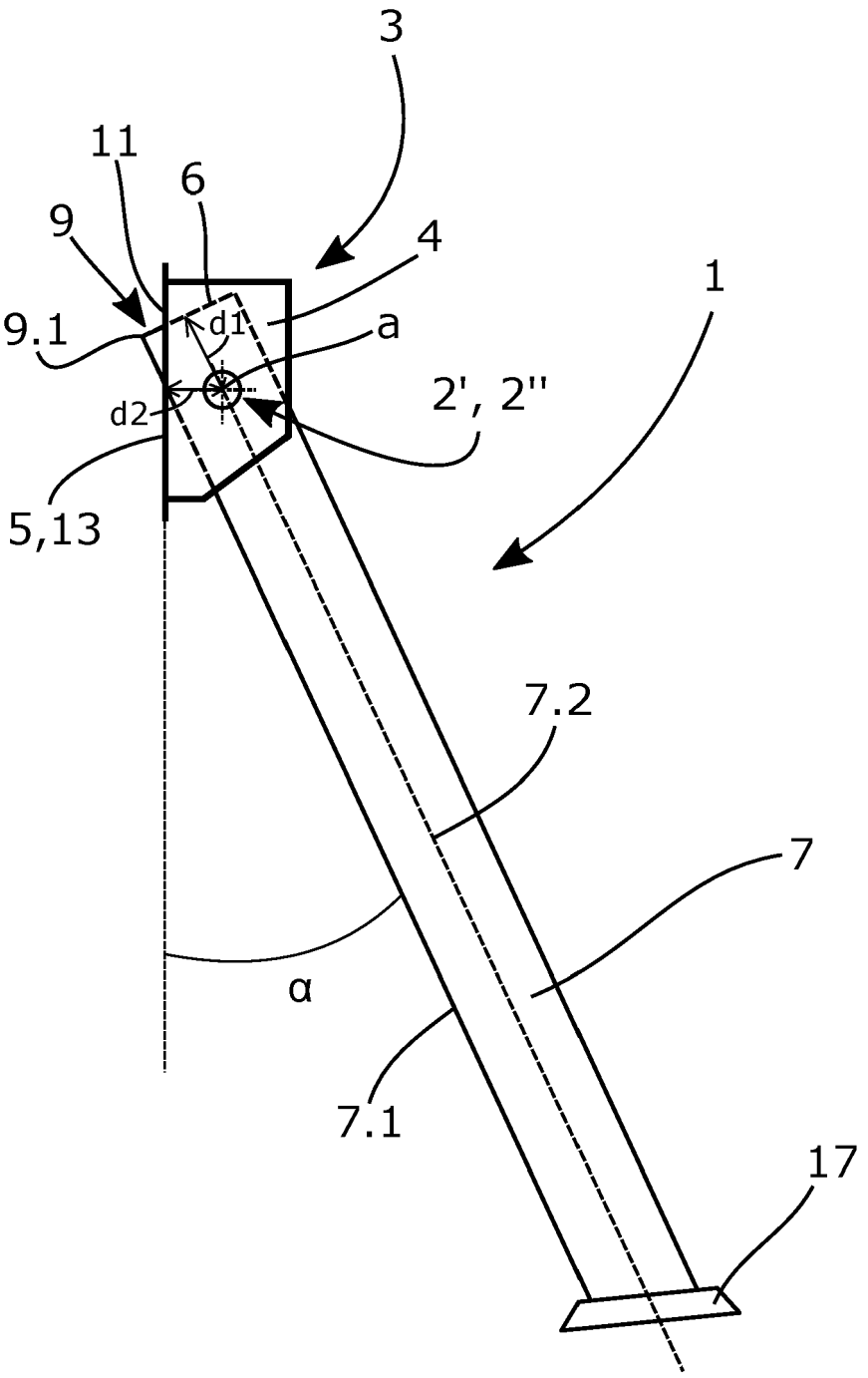

Fig. 1

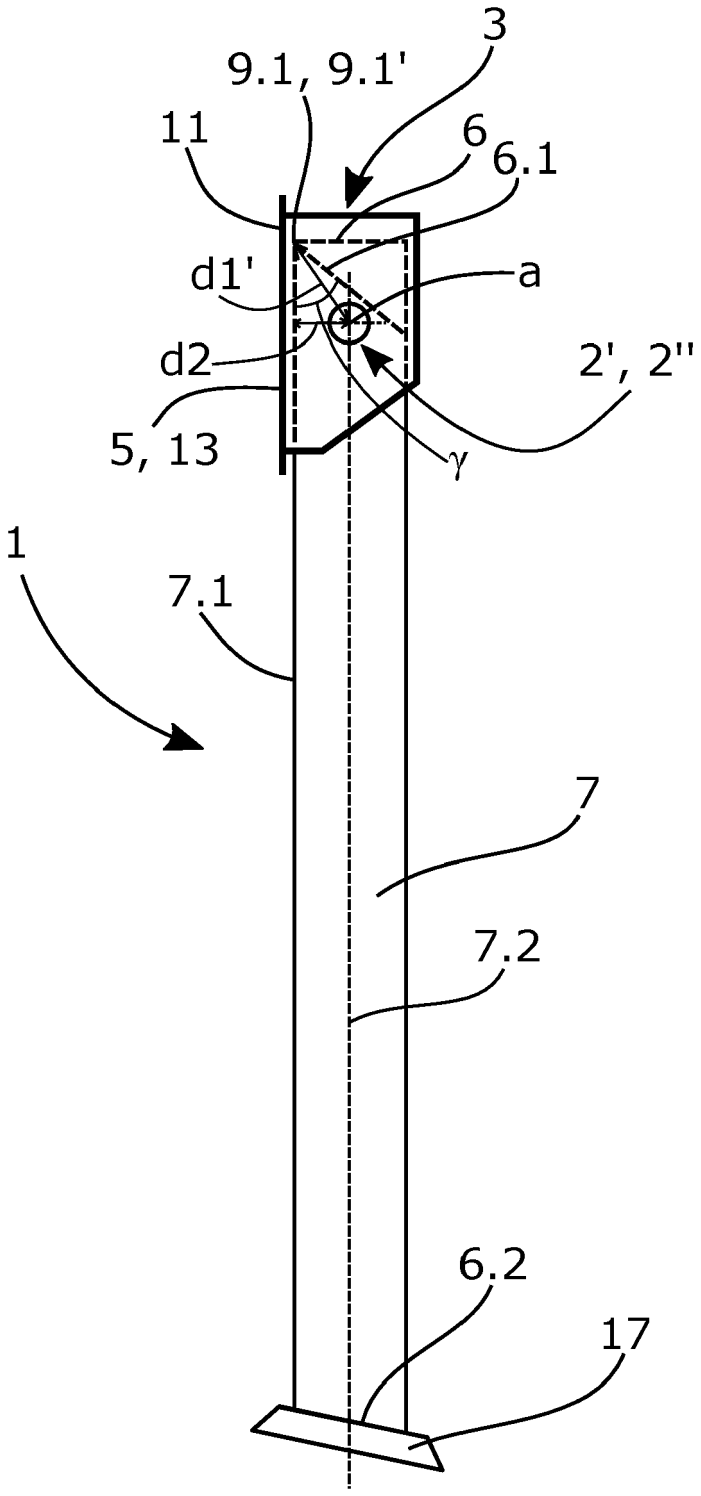

Fig. 2

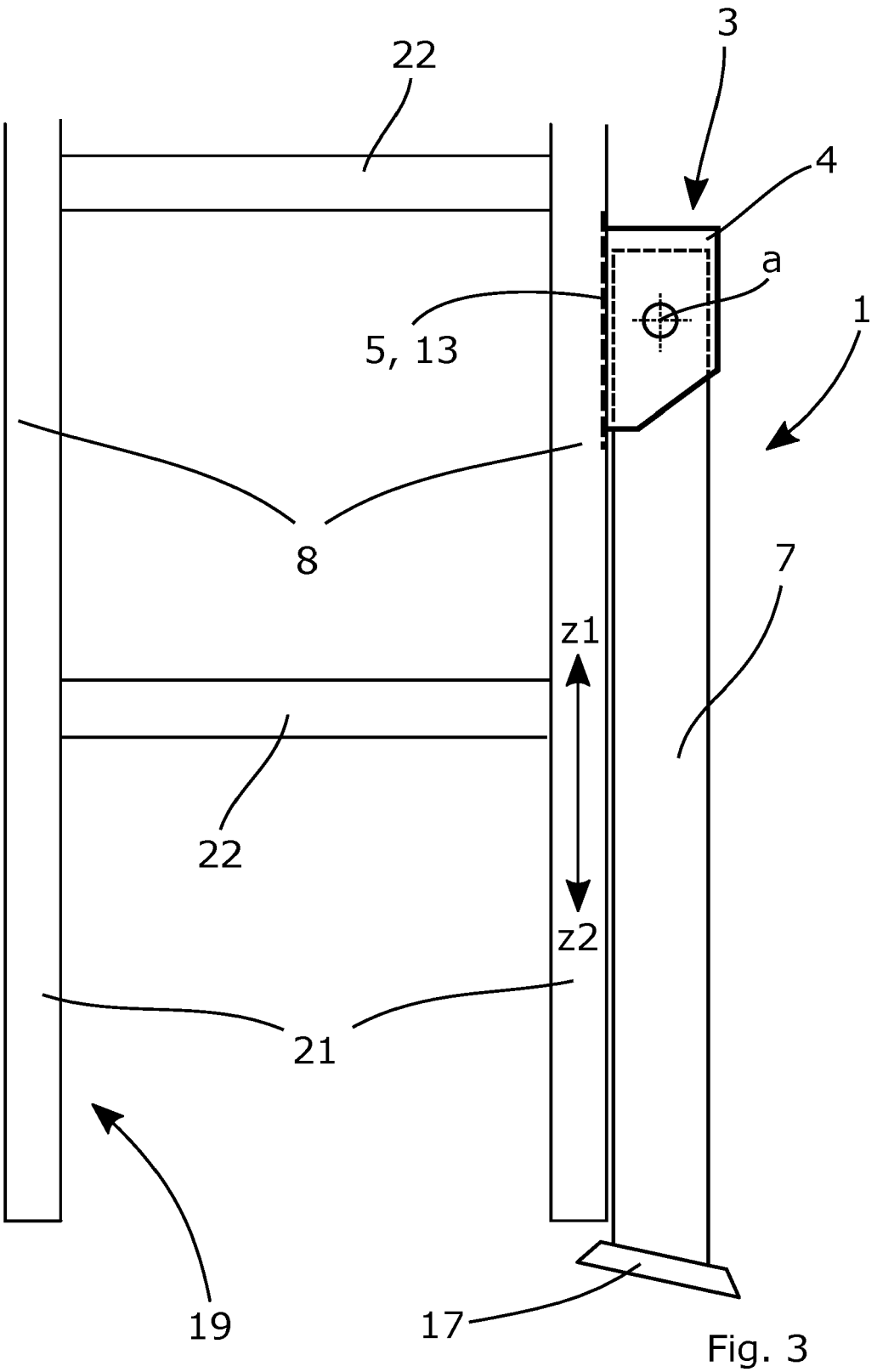

Fig. 3

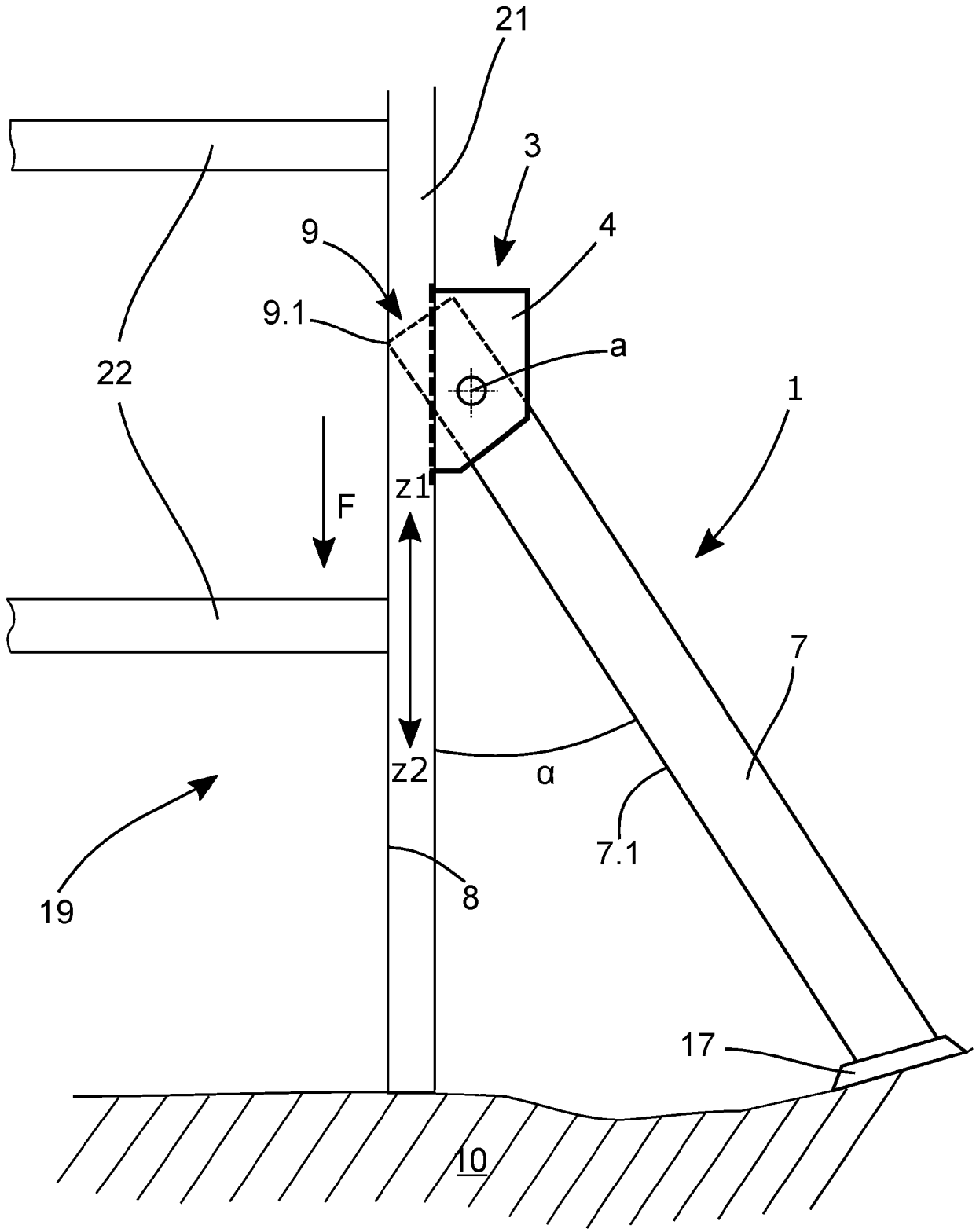

Fig. 4

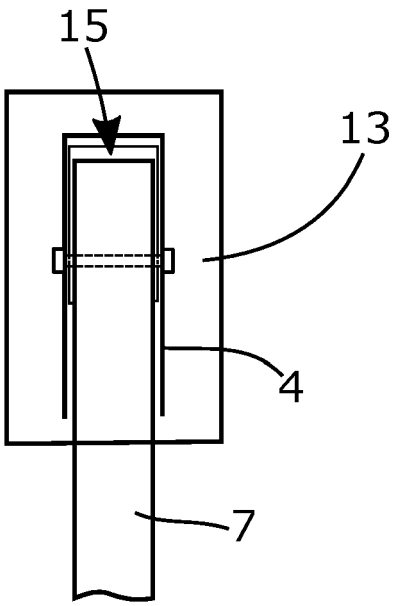

Fig. 5.1

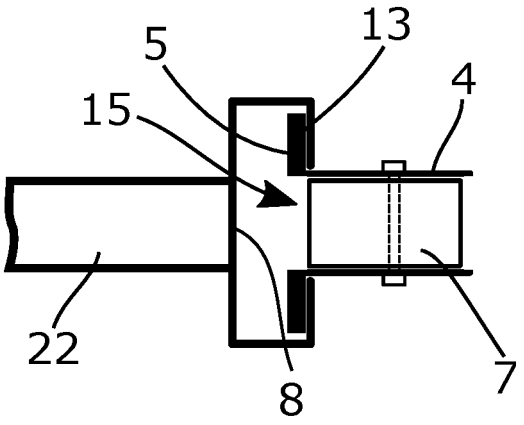

Fig. 5.2

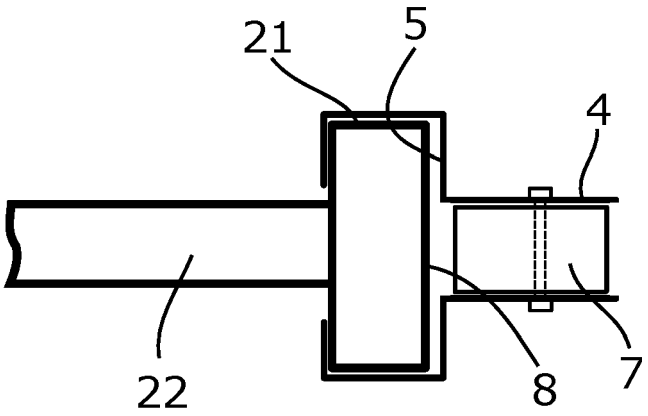

Fig. 6

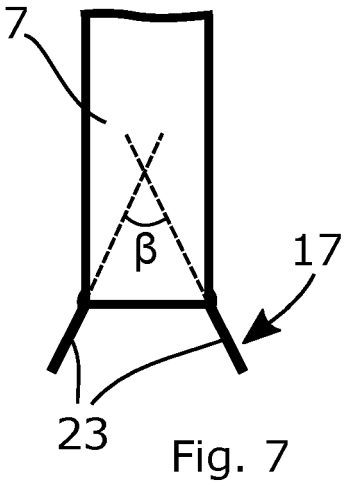

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 20 19 5413

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC) E06C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20 January 2021	Bauer, Josef

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 19 5413

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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